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## Mind-Body Trauma and Interoception: Reintegrating into the Body Through Dance/Movement Therapy

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**Mind-Body Trauma and Interoception:  
Reintegrating into the Body Through Dance/Movement Therapy**

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### **Abstract**

This literature review will provide an argument for the integration of dance/movement therapy (DMT) into neuropsychological spaces for the treatment of trauma, dysregulation, and mental health challenges. Reflecting on the United States of America's dualistic foundation of body and mind in both medical and psychological spaces, I will build an understanding of the nervous system's bidirectionality and its implications. Neurobiological research has shown that we can gain as much understanding of ourselves from our bodies as we can from our brains; they are interconnected. The theories provided will show that the path to trauma resolution and healing must incorporate a bodily reintegration and an awareness of adaptations and trauma from intergenerational inheritance. Through the DMT practice of building interoceptive awareness and externalizing trauma we can have a tool to feel safe in our bodies and in relation to others thus giving us access to our regulating social-engagement system and a window to homeostasis.

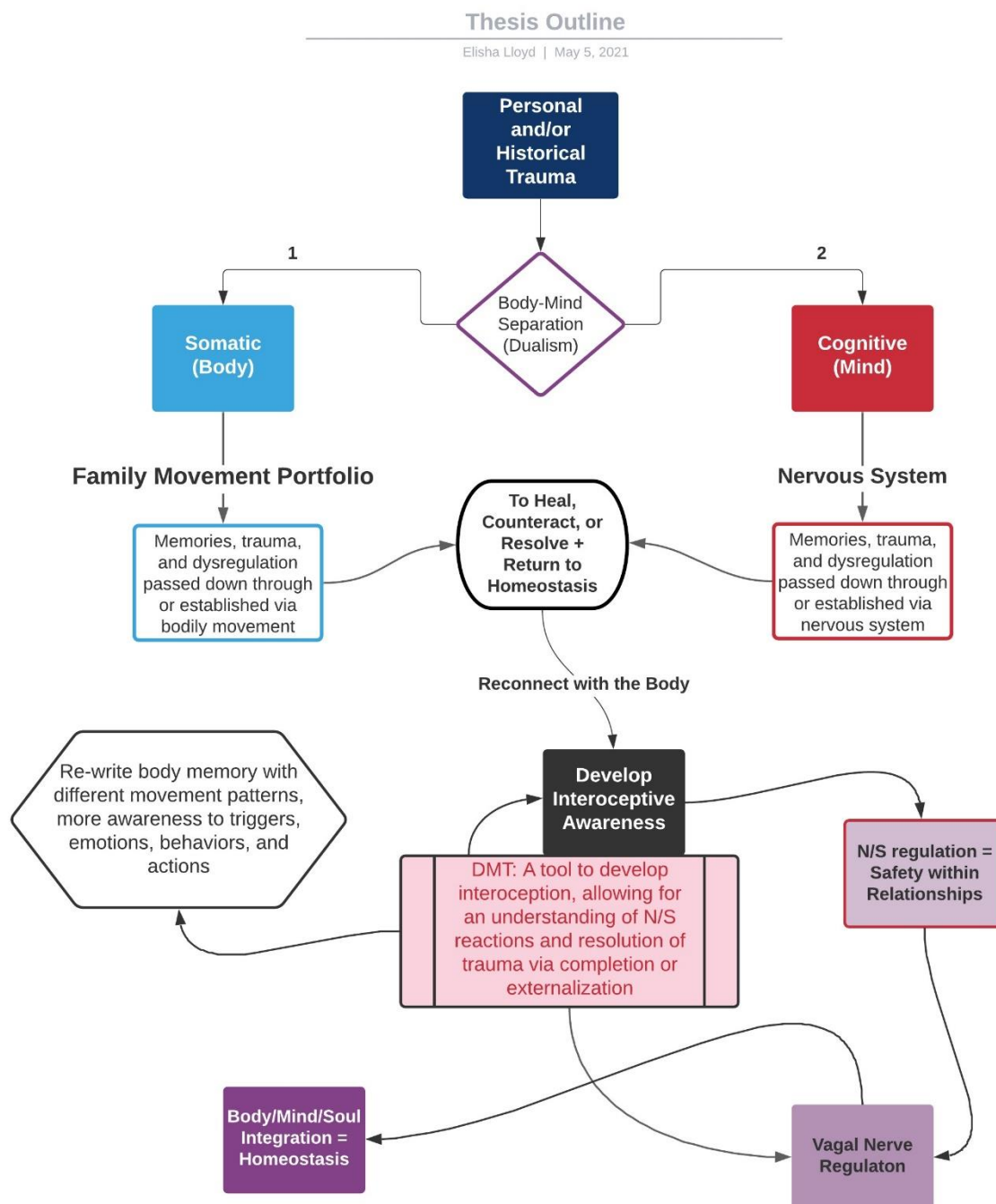
*Keywords:* Dance/movement therapy, embodiment, intergenerational trauma, interoception, mind-body reintegration, nervous system regulation, polyvagal theory, somatic disposition.

## **Mind-Body Trauma and Interoception:**

### **Reintegrating into the Body Through Dance/Movement Therapy**

Imagine speaking without words and understanding someone without thinking. Fusion dancing in San Francisco's Mission District with a person I shared under ten spoken words with will be a forever memory. With every motion, breath, and heartbeat, we were telling a story and it was one that we both knew well. I could feel who they were and where they had been, and they had the same understanding of me; fully witnessing one another in movement. This type of social witnessing is what nurtured my soul while living in the city and was part of the reason I was so drawn to the profession of dance/movement therapy (DMT). With the hustle and bustle of an area so driven and ripe with industrious people, my soul needed a repose, and dancing was where I found refuge. The nervous systems of these dancers gather from vastly different walks of life, regulating one another, and healing some not so faraway aspect of themselves.

This thesis will provide an argument for the inclusion of DMT into cognitive psychological spaces and the integration of DMT knowledge and practices for treatment of trauma, dysregulation, and mental health challenges. Right now DMT is seldom a part of biopsychological conversations from a scientifically based standpoint, but from what we can see in this thesis, the root of trauma and dysregulation in the United States is our disembodiment, which has been passed down intergenerationally. I will show that the path to trauma resolution and healing must incorporate an awareness of our bodies and the adaptations we have inherited from our family's bodies. As this thesis has several interlinking, albeit separate parts, please refer to Figure 1, below, for clarity.

**Figure 1***Diagram of Thesis Structure*

From my research over the past three years on our nervous system response and regulation, the polyvagal theory, intergenerational trauma, dance/movement therapy, and interoception, I have found that attention to and improvement upon our internal sense (interoception) can inform self-awareness, self-regulation, connection, and profound healing. Increased interoceptive ability allows a greater repertoire of expression which connects us to other individuals and for them to have a greater understanding of us. Through this social engagement, our body begins to feel a greater sense of safety and capability to rest. By integrating dance/movement therapy into the traditional therapeutic framework, we may be able to bring individuals, families, even communities down from their brains and into their feet to feel real connection, balance, and healing.

### *Preface*

This thesis is created out of my desire to comprehensively understand why movement and bodies feel so integral and important to my sense of wellness. So much of the joy I experience is somatic—from my interaction with others to my experience in the world. I moved across the US to the academic hub of Boston to understand why this is and to learn from experts in the dance/movement therapy field. That being said, the literature and other informational sources available to me while researching for this thesis were mostly academic in nature. Academic is defined here as works that were recorded, preserved, and authored by a predominantly privileged and therefore potentially biased point of view. I was born and raised in northern California with lineage spanning Arizona to Wales. I am a white, cisgender, able-bodied woman who grew up with burgeoning middle-class privilege and hushed trauma. This, among my many identities, has shaped the way I share this information, just as your own identities will inform your view as you read this.

***Notes to Reader***

*This article may have distressing material that could be upsetting. If you become disoriented or overwhelmed, take care of your well-being and take a break.*

**Body**

Our body remembers everything that has happened to us—every emotion felt, every sensation experienced, whether butterflies in the stomach or a jolt of shock in the chest (Wu, 2019). Our bodily tissues store these experiences (Macy, 2021; Wu, 2019). From birth we acquire our caregivers' somatic disposition along with their genetic blueprint shaped by cellular changes from past generations (Dieterich-Hartwell, 2017). This historical instruction manual may have adapted to account for unsafe environments, bringing nervous system responses out of balance. Whether the actions inside our bodies are consciously noticed or not, we are continuously attempting to reach homeostasis (Harshaw, 2015). To understand this inherited disposition and arrive in a space where mind, body, and soul are in balance, we must return to the place where it is kept and reintegrate into our bodies.

Neurological research has shown that we can gain as much understanding of ourselves from our bodies as we can from our brains (Homann, 2010; Khalsa et al., 2018; Savidaki, Demirtoka, & Rodriguez-Jimenez, 2020; Young, 2011). As North American people, however, we function in a dualistic fashion, historically understanding ourselves as a brain with a body. Our dualistic separation has become ingrained since European colonization, a process that brutalized human bodies. 500 years later, our bodies still remember the consequence of that process. One way to achieve reintegration is through interoception—a foundational aspect of dance/movement therapy. With interoception we can learn to externalize our past or present disharmony so that we can begin to live in a more holistic and healthy way.

## **Somatic Trauma Memory**

When a physical, emotional, cognitive, or spiritual violation transpires outside our control, we may disconnect from our bodies as a protective response, severing the connection between mind and body, ultimately making it difficult to recover (Rogers, 2019). Left unprocessed in our bodies, the reverberation of the event(s) may take form as a sharp pain, muscle constriction, holding of breath, numbness, disorders of the gastrointestinal tract, temperature sensitivity, a heightened heart or respiratory rate (Cutler, 2015; Macy, 2021). Rogers (2019) quotes a particularly striking passage from Bauer (2005) that explains this phenomenon:

Traumatic experiences not only distance and estrange the onlooker but are inherently marked by a rift between the victim and (their) experience; the shattering force of trauma results from precisely that brutal expropriation of the victim's self. Thus, because trauma is dispossession and radical self-estrangement, it defines the traumatised individual through somethings (they) do not own. (p. 496)

In addition to trauma incurred due to particular events, repeatedly endured stress—individually, culturally, intergenerationally, or historically—may accumulate to a point where the self functions, as a default, in a fight, flight, or freeze state, which also causes harm. Existing days, months, and years in this state puts stress on bodily functions and will eventually adversely affect our health (Cutler, 2015; Macy, 2021). Our system can safely handle a limited amount of stress. Outside of those parameters, our ability to cope with the consequences of stress drops dramatically, resulting in a degradation of health, the symptoms of which show up in physical, cognitive, or behavioral disorders (Cutler, 2015; Wu, 2019). Talk or cognitive psychotherapy can create profound recovery, yet there is a whole organism below the brain and tongue that needs to



heal. As Menakem (2017) notes: “The place to begin that (familial, community, and cultural) healing is in each of our bodies—starting with yours” (p. 133).

### **The Separation from Our Bodies**

We have always been somatic beings, yet our connection to our bodies have been interrupted, particularly in westernized populations such as the United States. Here, looking at oneself holistically is an unfamiliar concept. How was the migration up and out of the internal senses provoked? There have been centuries in the making where experiencing life in the body was and is exceptionally difficult, seen as too vulnerable, and traumatizing in and of itself (DeGruy, 2005). Menakem (2017) states that this distanced relationship is largely due to the treatment of bodies in the European medieval ages from the 5<sup>th</sup> to 15<sup>th</sup> century where torture was commonplace and consumed as a spectacle sport. He explains that the nervous systems of both the tortured and the bystanders witnessing the horrific events become altered (Menakem, 2017). The mirror neurons in the bystanders’ bodies experienced the torture as their own and the incidents stayed locked in their psychophysical composition (DeGruy, 2005; Dieterich-Hartwell, 2017; Menakem, 2017).

This compounded bodily destruction and dysregulation was shipped into North America in the bodies of European settlers. Over the past 500 years, these colonizers passed on their embodied perpetration, bringing about displacement, sickness, cultural genocide, war, famine, racism, and countless other atrocities (DeGruy, 2005; Walters et al., 2011). Europeans forcibly and systematically effaced fundamental aspects of Indigenous American culture. Spiritual practices, languages, traditional ways of interacting, thinking, and moving through community were unilaterally assaulted in the attempt of forced assimilation (Walters et al., 2011). White settlers enslaved Black peoples and treated their bodies as their European predecessors had been

treated generations before, continuing passing on their cultural pain somatically (DeGruy, 2005; Menakem, 2017).

### ***Notes to Reader***

*That was a lot to take in—what was your somatic response? Wiggle your toes and take a quick step out of your brain; your feet are the furthest extremities from your head and focusing on or feeling them can help bring you into your body and ground you.*

When exactly did the conceptualization of the brain as separate from the body begin? During the 17<sup>th</sup> century, philosophers appreciated intellectualizing the workings of the world. Rene Descartes is prominent for deductively reasoning that the mind was not a physical thing. The understanding was that non-physical and physical systems could not interact and that while the brain can affect the body, the body simply cannot affect the brain (Berrios, 2018; Massey 2015). Reductionism was birthed, which regarded the world as a machine with different parts working in tandem (Massey, 2015). This 17<sup>th</sup> century view influenced Giovanni Borelli who conceptualized the theory of biomechanics, which solidified the notion that the human body was mechanical with the mind being one separate cog or circuit (Berrios, 2018; Massey, 2015). It is no coincidence that these theories came into fruition as chattel slavery and the commodification of bodies was established in North America.

The body is very much an organic, malleable organism that functions far differently than any machine does. We do not have levers and pulleys and while our tendons, muscles, and bones are expert at carrying us, we are not made to function systematically. The dualistic and body-as-a-machine framework bled into the western medical system and bodies were treated as if emotion and mental or soulful suffering had no distinguishable consequence (Massey, 2015).

This approach is still the basis of westernized medicine and psychotherapy today (Aposhyan, 2004).

It was not until the 19<sup>th</sup> century when sociologists began to see how the body was tied to social inequities through the reverberations of abhorrent living and working conditions and poor health care access (Walters et al., 2011). Even with this unveiling, mindsets would not be changed until the Depression Era when “American researchers began to move away from “faulty gene” research to explore how social, economic, and political forces were expressed in bodies” (Walters et al., 2011). Neurobiologists now understand the brain as existing in the entire body, as it runs the course of the whole nervous system, which spreads like roots from our skull to our toes (Savidaki, Demirtoka, & Rodriguez-Jimenez, 2020).

### **The Significance of Equilibrium**

Consider how everything on earth, in this plane of existence, relies on the intricate composition of balance. Organisms continuously evolve from exposure to the environment and to survive. Changes occur in response to different threats; an under or overabundance of resources, the evolution of species around them, and otherwise (Porges, 2001). We are products of constant homeostatic flux and have sprouted intricate neurological systems with adaptations over millennia. This mapping understands and signals when resources and actions are required, such as acquiring nutrients, oxygen, water, regulating blood flow, healing, connection, protection, and rest, bringing the whole organism into balance (Breit et al., 2018). Without this characteristic we would not be here.

Humans who have been acclimated to an industrialized and individualistic society find it challenging to accurately read their internal landscape or adjust accordingly to their environment because their internal selves have become dysregulated, traumatized, and left with unresolved

suffering. As detailed above, this is in part due to colonization which has eradicated or stigmatized the stability and healing of cultural rituals, community structure, and spirituality (Menakem, 2017). We have been left with vicarious and personal pain which then passes on to our children and our children's children through our cells and nervous system as well as through embodiment of family "somatic disposition" (Young, 2002).

### **Intergenerational Trauma**

"The stories of your ancestors are not lost; you will find them humming in your bones" (Kent, 2011, p. 258). The cells we are composed of, and more precisely our DNA, is our coding for how to grow, maintain internal stability, survive, and reproduce. All of this information is passed down through our ancestral lineage who, in the form of DNA, are still living within us (Menakem, 2017; Rogers, 2019; Shipony et al., 2014). There is importance in learning about our predecessors and what they experienced. Their personal experiences can change their genetic structure and be passed down, so in a way we are made in the image of those experiences. The changes in our ancestors' survival and homeostatic mechanisms on the cellular level drive the actions and reactions within us, and many changes throughout our own lifetimes, including further disintegration or healing, can be passed on to our offspring (Rogers, 2019; Shipony et al., 2014). Rogers (2019) posits a description of how intergenerational trauma occurs as "tiny chemical tags (that) are added or removed from DNA in dynamic response to an individual's social and biological context...and it is these inherited tags that have been identified as potentially triggering intergenerational PTSD in human and animal populations" (p. 493).

What is of note is that researchers have not focused on what allows people to remain healthy in the event that historical or intergenerational trauma is passed down to them (Walters et al., 2011). Duran (2010) elaborates:

We treat it as if it was just a biological situation. It is biological, but that biology has a source; it has a father, a mother, remember, grandpa, and grandma. And if we start looking at that every time you talk to somebody who comes in presenting with this entity or this relative called (illness), if you start thinking that way, then it opens it up for the patient to also be able to tell you what they are experiencing. (pp. 24-25).

Opening ourselves up to a holistic relationship with our body and its internal, emotional, and social processes can lead us to healing, connection, and regulation. This healing will not only affect our own selves but will resolve our ancestor's trauma and our future generations (Menakem, 2017; Wu, 2019).

### **A Family Movement Portfolio**

“Whether by imitation or resistance, (children's) bodies memorialize the family's way of being in the world. The body is one of our family traditions” (Young, 2002, p. 26).

Family memories are not only passed down through DNA, oral or written narratives, rituals, heirlooms, or photographic captures. Family legacies can be carried on through “somatic disposition” (Young, 2002). “Somatic disposition” refers to a person's patterns of movement and ways of interacting with the world through their fine and gross motor functions. These physical gestures, postures, tones of voice, attitudes, facial expressions, and the sequencing of these actions are learned through imitation during infancy as an evolutionary adaptation to adopt caregivers' strategies for communication, social capital, and survival (Dieterich-Hartwell, 2017; Porges, 2001; Young, 2002). Children observe their caregivers' motor patterns and embody them, thus creating a *family movement portfolio* that will continue to be passed down generation after generation.

Our *family movement portfolios* can become burdensome or maladaptive when the child somatically memorializes the movement disposition and behaviors of abusive caretaker(s) (DeGruy, 2005). In this case the legacy of trauma or emotional strife is inherited as the behaviors, actions, and associated beliefs (DeGruy, 2005). Physical gestures—such as movements of the face, hands, arms, and body that are used in various speeds, directions, shapes, weight, and flow to communicate non-verbally—are part of this legacy (Young, 2002). As Young (2002) describes, these gestures are reactions to internal emotional processing and as responses to current external conditions, a so-called “habit body” (Young, 2002), all of which intergenerational trauma lays claim to. This suggests that the gestures we learn in childhood are in fact the instruction manual for how to process emotions and respond to our environment.

“Much of our emotional life is lived unconsciously, and this unconscious life is far richer than our conscious feelings—for example, our conscious mind will already be reacting to situations of danger some time before we begin to be afraid” (Young, 2011, p. 8). When people live in a harmful environment, they can become hypervigilant in noticing gestures and affect cues as a strategy to protect against another traumatic incident (Dieterich-Hartwell, 2017). In addition to hypervigilance, certain facial expressions in specific situations within and beyond the abusive environment can be more often interpreted by the victim as negative or dangerous (Dieterich-Hartwell, 2017; Macy, 2021). This is how trauma affects the part of the brain responsible for translating facial expressions, body language, and speech. Engaging in social spaces and relationships as traumatized individuals can be painful and challenging, as their interpretations and their emotional reaction to those interpretations can be based on an instruction manual written in the language of harm.

The nervous systems of those who have suffered repeated neurobiological stress trends in a hypo or hyper-aroused state (Dieterich-Hartwell, 2017). Neurologically, this means the autonomic nervous system (ANS) is not comfortably regulated between parasympathetic or sympathetic systems. Over time the victim's body overcompensates in an attempt to manage the stress and changes on a chemical and neurological level, making the return to homeostasis almost impossible (Macy, 2021; Oldroyd et al., 2019). Those bodily states can then become habituated and integrated as identity. With traumatic memory thus embodied, past traumas live into present realities where they can be continuously felt and reenacted (Wu, 2019). In these ways, through the integration of "somatic disposition" and neurobiological changes, the body becomes a bridge between past and present and therefore plays an important role in the transmission of dysregulation (Stanek, 2015). "Embodiment acknowledges that while bodies tell [his]stories, they reveal stories that are also not conscious, hidden, forbidden, or even denied by individuals or groups" (Walters et al., 2011). Young (2006) elucidates upon this point:

Our bodies carry the scars of our historical traumas, not just physically, but also in behavioural holding patterns, in deep muscle structures, in visceral tensions, in our shape and morphology, in patterns of psychodynamic transference, and in distortions of our perceptions. Our bodies have become, in effect, our psychic dustbins, and we need to find ways of working with all of these aspects constructively (p. 23).

Bringing awareness to emotions, sensations, or physical states felt in response to stressors will open a gateway to embodied memories and reactions (Wu, 2019). These neurobiological responses can be internally and externally observed, studied, and deconstructed to find the source of why our bodies have been fine tuned to react in unique ways that bar individuals and societies from feeling safe with our own and with each other's bodies (Harshaw, 2015). This somatic

awareness and understanding is necessary for healing trauma and cultivating the ability to achieve resolution.

### **The Nervous System**

The brain is the organ that orchestrates our interactions with the world around us. It is responsible for taking in massive amounts of simultaneous sensory information, sorting out and interpreting what we are experiencing based on past associations, and then coordinating our response. This dynamic interchange between body and brain is ongoing, even in stillness, and the functioning of the mind is communicated and experienced through the body (Homann, 2010, p. 80).

There is a bidirectional exchange of information from the brain to the body and body to the brain, one major operant of which is the vagus nerve (Porges, 2001; Dieterich-Hartwell, 2017). While its name is singular, the vagus is a nerve encasement comprising thousands of efferent and afferent neurons which relay information from the inner organs, muscles, mucosa, and vascular activity to the brain and vice versa (Breit et al., 2018; Harshaw, 2015). This nerve system sprouts from the medulla, trickles down the spine, enervates our viscera, and orchestrates a variety of crucial functions such as heart rate, mood modulation, immune response, and digestion (Breit et al., 2018; Porges, 2001). This phenomenal structure is seasoned in continual attentiveness and has evolved to sense and react to any internal or external environmental change (Harshaw, 2015).

You may have heard of our nervous system responses of “fight, flight, or freeze” (some include “fawn” and “annihilate”), as well as “rest and digest” (some also say “feed and breed”). These responses are attributed, respectively, to the autonomic nervous system’s (ANS) sympathetic and parasympathetic branches, which evolved to maintain overall homeostasis and



operate social and defensive actions (Dieterich-Hartwell, 2017; Macy, 2021; Porges, 2001). An important constituent of our ANS is the counterbalancing action of our peripheral nervous system to our sympathetic nervous system (Breit et al., 2018). When there is an imbalance, various psychological or physiological disorders can arise.

Our brain signals a fear response when the sympathetic nervous system senses environmental cues that could be translated as danger; a ventral vagal response. This instructs our heart's pace and blood outflow to increase, our lungs to oxygenate our vasculature system, and our stomach to stop digesting so that our energy is conserved. These cues can range from the observation of minute facial expressions that have been encoded into our nervous system as anger, to overt danger.

Our shutdown, which can escalate to tonic immobility, is a dorsal vagal parasympathetic response (Dieterich-Hartwell, 2017; Porges, 2001; Wu, 2019). Our nervous system can shut down in situations of overwhelming danger or fear as a protective mechanism and may stay in this mode for years, even decades (Wu, 2019). This shutdown from someone in our lineage can be passed down to our nervous system, through our DNA (Shipony et al., 2014). Until we go through the process of completing that fear response through externalization and trauma resolution, we may continue to function this way (Wu, 2019).

Porges (2001) posited that the vagal structure has a third developmental stage apart from mobilization and immobilization—social connection. The theory responsible for our connections with others is called the polyvagal theory. “Polyvagal” means wandering nerve, a term that beautifully illustrates a structure that has evolved to help us engage in healthy relationships. A neuroception of safety is necessary for a social connection to be useful as part of our homeostatic response. If our system remains in a state of perpetual fight, flight, or freeze then that

prerequisite sense of safety will not be present for healing, making the recovery process all that more challenging.

### **Polyvagal Theory**

About eighty percent of the nerve fibers of the vagus have afferent fibers which send signals from the body's organs to the brain (Breit et al., 2018). When we pay attention, we can physically sense parts of our vagal system. The polyvagal theory suggests that our ANS has evolved over time to involve social interaction (or the "social engagement system") as part of the process of achieving homeostasis (Macy, 2021; Porges, 2001). Macy (2021) describes that this adaptation includes a "playful mixture of activation and calming that operates out of unique nerve influence" that moves us back to equilibrium and helps us navigate relationships. The polyvagal system, as the most recently evolved branch of the ANS, is responsible for controlling facial, head, and neck muscles, speech, and self-soothing behaviors (Dieterich-Hartwell, 2017), all of which play a major role in how we relate to ourselves and one another.

Referring to *Family Movement Portfolio*, we can see how the polyvagal nerve and movement patterns work in tandem to create a cycle of trauma. When abuse or trauma has been inflicted, we have a greater likelihood of interpreting others facial expressions, movement, and speech patterns as precursors to danger (Dieterich-Hartwell, 2017; Macy, 2021). Compounded is the likelihood that the affect of the traumatized individual may in turn be interpreted by others as atypical due to their somatic disposition. With the added challenge to connect socially through our expressive communication, it becomes difficult for traumatized individuals to come into homeostasis through social connection, thereby staying isolated and stuck within no longer useful cycles of fight, flight, or freeze states that may later develop into chronic stress and illness (Macy, 2021; Oldroyd et al., 2019). Thus, a feedback loop of anxious awareness is present

from sense of self to sense of others in relation to themselves. The ventral vagal social connection system is made inaccessible as actions from others will be felt by our nervous system (called neuroception) as unsafe and homeostasis less attainable.

One important characteristic of neuroception is that safety needs to be felt before we can foster healing, regulation, and restoration (Dieterich-Hartwell, 2017; Macy, 2021; Porges, 2001). This theory is based on the belief that prosocial engagement such as conversation, communication, and connectedness is imperative to humans due to our physical vulnerability—we have survived because we have adapted (Porges, 2001) to cooperate, and in order to cooperate we had to co-regulate with another (Macy, 2021).

### **Interoception**

Invariably, the taxonomy of our awareness and interpretation of our internal bodily cues have undergone several changes due to the involvement and evolution of many physiological systems (Harshaw, 2015; Khalsa et al., 2018). Scientists currently understand the awareness and interpretation of our internal bodily cues as “interoception” or “interoceptive awareness”, which is how our nervous system senses signals from our internal landscape and processes them to achieve a constant understanding of bodily conditions (see, e.g., Khalsa et al., 2018; Mehling et al., 2012; Oldroyd et al., 2019). This process exists due to bidirectional nerve fibers that assess internal and external cues to control bodily functions, emotions, and to achieve homeostasis (Harshaw, 2015; Khalsa et al., 2018, Mehling et al., 2012). This assessment is highly influenced by contexts, our beliefs, experiences, objectives, and a variety of other factors (Mehling et al., 2012). Khalsa et al. (2018) describes that:

Interoception seemingly involves a high degree of connectivity within the brain. It appears to be tightly linked to the self and survival through homeostatic maintenance of

the body, and by helping us to represent how things are going in the present with respect to the experienced past and the anticipated future. These computations may depend on what has occurred to shape the body's internal landscape, and it is in this regard that learning, and malleability of representations over time, could play important roles. (p. 509).

Researchers' interpretation of the human brain versus body signaling adaptations are principally different because the neural circuitry that allows interoceptive processing stretches through most bodily functions and can exist as specialized, singular, or functionally coupled structures (Khalsa et al., 2018). Additional research needs to be done to come to a consensus on how this system has evolved. As the primary system in processing and regulating our emotions and behavior, and maintaining homeostasis, many studies and models have linked interoceptive dysfunction to mental health illness such as anxiety, PTSD, depression, and mood disorders (Harshaw, 2015). Eventually, we may discern whether interoceptive dysfunction is a product of poor mental health or if poor mental health is a side effect of interoceptive dysfunction (Harshaw, 2015; Khalsa et al., 2018). One undertaking would be to examine the agents of homeostasis by distinguishing where the neural systems of pain, emotion, and cognition overlap or even integrate with the interoception system. This work could map out how exactly interoception is directly related to mental wellness (Khalsa et al., 2018).

This internal feedback loop has gained prominence as researchers discovered its links to biological functioning, some examples being the urinary and gastrointestinal systems, cardiac and respiratory rhythms, and other homeostatic properties of the body. While the physical aspects have been traced, research on the social foundations—i.e. the influences of a person's family, ancestry, and social background—is missing (Oldroyd et al., 2019). By examining

children's attachment bonds to caregivers and the embodiment of their somatic disposition, one will find that children's thoughts, movements, and behavioral patterns "influence a range of functioning from emotion regulation to how they experience their close relationships" (Oldroyd et al., 2019). When a child lives in an environment where the caregivers are supportive, caring, attentive, and the child feels loved, secure, and confident in the relationship; they will be able to better manage anxiety and hardships through the trust and trust in the use of social engagement to help solve or guide them through challenges (Oldroyd et al., 2019). Oldroyd et al. (2019) shares the perspective that:

Interoception, a very embodied phenomenon, has social origins. From this perspective, interoception develops initially in the context of interpersonal relationships. To the extent that caregivers recognize, honor, and respect their children's bodily experiences, the child will develop more accurate interoception. To the extent that a child's bodily experiences are denied, devalued, ignored, or punished by parents, the child will find ways to avoid feeling them, and develop a distorted sense of interoception. (p. 10).

If the caregiver-child bond has been corroded, resulting in anxious, avoidant, or disorganized attachment, then the child's awareness and/or translation of their interoceptive signals may be inaccurate due to the habitual and internalized neglect of their needs. Therefore, children with interoceptive dysfunction may not know if what they are sensing is a need or even a real perception. Through living in a consistently abusive or stressful environment, the body will produce stress chemicals and become continuously dysregulated, unable to achieve homeostasis (Macy, 2021; Oldroyd et al., 2019). This may permanently alter the child's comprehension of their bodily cues. "Given that stress and interoceptive functioning utilize the same anatomical pathways to facilitate communication between the brain and the body, attachment related

processes that affect the stress response system (the descending brain-body connection) could also affect the interoceptive system (the ascending brain-body connection)” (Oldroyd et al., 2019).

Studies have shown that attachment style is reflected in our relationship to our internal selves, which is in turn reflected in our interpersonal relationships (Oldroyd et al., 2019). A person whose attachment foundation is anxious has a hypervigilant awareness of their interoception. This hypervigilance can manifest as how they experience their social connection due to interpreting cues as dangerous or untrustworthy (Young, 2011). This is similar to the aforementioned translation of facial expressions as negative, also a result of hypervigilance.

Individuals with avoidant attachment styles are shown to have less of a connection with their internal cues. From this they may have less interoceptive knowledge and thus are also less likely to naturally achieve homeostasis (Oldroyd et al., 2019). Since interoception influences our physiological and psychological states, there is a great “importance of distinguishing sensation (i.e., the raw signals conveyed by bodily sensors) from perception” (Khalsa et al., 2018, p. 502). Those who do not have that sense or who are hypervigilant of it may have a greater likelihood of developing physical or mental illness or distress.

Thankfully there are ways to counteract interoceptive dysregulation. Some of these include medications, cognitive-behavioral therapy, exposure and response therapy, respiratory training to allow individuals more control over symptoms such as panic attacks, and mindfulness and body-based therapy (Khalsa et al., 2018). Khalsa et al. (2018) express that interoception may be improved through “mindfulness-based stress reduction, yoga, and other meditation/movement-based treatments may be aimed at improving metacognitive awareness of mind–body connections by systematically attending to sensations of breathing, cognitions, and/or

other modulated body states (e.g., muscle stretching)” (509). DMT is one such therapy whose main components include this type of treatment.

### **Dance/Movement Therapy**

Nothing so clearly and inevitably reveals the inner (self) than movement and gesture. It is quite possible, if one chooses, to conceal and dissimulate behind words or paintings or statues or other forms of human expression, but the moment you move you stand revealed, for good or ill, for what you are. –Doris Humphrey, n.d.

Movement is one of our most intimate and vulnerable ways of being. Our bodies store memories that our cognition has long forgotten. This culmination of somatic history, from how we moved in-utero to what we have experienced and learned up until this moment, is what is expressed when we move. Stances, shifts, gestures, and automatic motions are how we engage with the world. Movement is human’s first form of communication (Macy, 2021).

While illuminating information is kept within the body, it can be unreadable until a safe relationship between mind (what some view as “self”) and body (our internal workings) has been fostered. Establishing this deep or heightened connection is not without its challenges, particularly for those whose bodies have been traumatized, shamed, stigmatized, marginalized, etc. Verbally recounting traumatic memories can be difficult. As trauma affects the language center of our brains, language cannot access traumatic memories (Dieterich-Hartwell, 2017). Some have shut down the areas in our brain that hold visceral memories or emotions, leaving a numbness and greater difficulty in finding purpose or direction in life (Dieterich-Hartwell, 2017). Tuning into physical sensations may be a reminder of endured trauma and can be overwhelming and even re-traumatizing, as our bodies have the tenacity to show its visitor all the horror, sorrow, joy, excitement, pain it has experienced.

Tapping into interoceptive knowingness requires an experienced and loving guide to accompany our inward visits to our threshold, then gently bring us back to a place of safety and familiarity (Macy, 2021). Many agree professional support is key: “when the handling is good enough the psyche can indwell in the body (soma) providing a sense of internal reality and structure of the self” (Savidaki, Demirtoka, & Rodriguez-Jimenez, 2020, p. 2). As the polyvagal theory suggests, our nervous system is wired with a need to feel safety in others and in our surroundings before we can begin to loosen the grip and relax into ourselves.

### *History of DMT*

Marian Chace first developed the profession of DMT in the 1940s. She observed that movement patterns reflect patients’ mental states. Millman et al. (2020) describes that “the physical movements of the body are shaped in part by the affective states of a person; changes in one's movement patterns have the potential to facilitate corresponding changes in their psychological and social experiences” (p. 1). Many authors describe DMT as a body-oriented approach that entrusts the viability of the mind-body connection as well as the use of verbal and non-verbal language to assess and help clients achieve mental, physical, social, and emotional integration (Millman et al., 2020; Hindi, 2012; Krantz, 1999).

As this modality has grown, so has its conceptualization of movement and dance. In 1996, Christine Caldwell, a dance/movement therapist and psychotherapist noted that movement does not need to have a perimeter, the body is in constant flux even when appearing stationary (Hindi, 2012). This movement comes from our lungs expanding and contracting as we breathe to our cells dividing as we heal (Hindi, 2012). The awareness and internal tracing of our states of being is now integral to DMT theory as it encourages a connection between bodily states and emotions. When this connection is nurtured it can help clients navigate identity-development,



social connectedness, present and intergenerational trauma, emotional processing, body regulation, and perspective on or relief from mental illness (Harshaw, 2015; Hindi, 2012; Macy, 2021).

While body-based therapists provide a powerful vessel for healing trauma, and expressive therapists tap into human's innate creativity, playfulness, and connection, DMT is unique in its therapeutic structure that integrates both body and expression. DMT creates a blueprint to interpret and understand bodily sensations with curiosity, depth, and mindfulness, and to sit with them just as they are. Eventually, the client may be able to reintegrate into their body and gracefully move towards greater self-awareness, self-expression, and homeostasis.

### **Externalization**

With the application of “honesty, concentration, and work...pure movement and dance (can) profoundly deepen self-knowledge and lead to insight. From this point of view, the body is seen as a repository, a point of reference, and a vehicle for expression” (Evan, 1972, p. 2).

Macy (2021) indicates that when a person has psychological trauma, anxiety, stress, or depression, there are overwhelming demands placed upon the physiological system that result in a profound felt sense of loss of control, vulnerability, immobilization, betrayal, and increased appraisal. If there is no externalization of trauma, the distressing memories are encased in the body until it is processed. Building interoception and the capability to identify and externalize the destabilization allows us to release the embodied trauma and rebuild both internal and external supports that we have lost (Macy, 2021). Stanek (2015) reflects that:

The body is often neglected in the socially constructed body/mind dichotomy; however, the body actively shapes the perception of subjectivity and intersubjectivity, and is the primary container for traumatic memory...(therefore) the body plays a major role in

transmission of trauma. Dance/movement therapy's (DMT) focus of the body in movement is particularly suited for the work of releasing material that has been transmitted unconsciously (p. 95).

DMT's positive outcomes on interpersonal relationships is rooted in its practices of trust. Building upon our awareness of and ability to interpret internal and external movement patterns through interoception, we may begin to realize if, when, or why our nervous systems switch into a "fight, flight, or freeze" state and what feelings we may be inhibiting to protect us from recurring trauma. Techniques such as dance, visual expression, vocalizing, and other body-based practices can be used to help us complete the actions needed to resolve trauma and discover we no longer need to exist in constant survival mode. Intentionally externalizing internal dysregulation or turmoil in a way that describes the suffering gives new meaning to its effects and allows an active confrontation of these issues (Krantz, 1999). Applying our developing ability to externalize and regulate, we can successfully move toward homeostasis.

Blanche Evan, a founder of the DMT modality, understood that every behavior or action a person enacts is "psychosomatic and psychophysical" due to the bidirectional interaction of the body and mind through the functioning of the spine (Krantz, 1999). From Evan's model we can see, beyond the framing of neurology, how the body interacts with the mind. When we move or dance, we demonstrate how both work together to influence our overall cognitive, bodily, and emotional states (Krantz, 1999; Krantz & Pennebaker, 2007). Evan "correlated the physiological functions of the spine with psychological functioning. She also felt that the spine played a role in accessing the unconscious" (Hindi, 2012, p. 135). In her model, when people suppress their physical movements, their emotional expression and communication also become inhibited.

Looking at movement from a traditionally cognitive lens, the brain-body connection is categorized as a single organism; stagnant body movements result in lessened functioning of correlated brain areas. Moreover, suppressed movement leads to decreased oxygenation of the brain. Active movement increases our respiratory rate and oxygen intake as well as our cardiac output. Through movement, more oxygen enters cells and activates the mitochondria, the “powerhouse” of the cell that metabolizes energy (LaMothe, 2015). Not only does increased oxygen and energy help power the brain, movement also catalyzes neurogenesis and synaptic plasticity (LaMothe, 2015). Ultimately, movement is what forms a higher connectivity within the brain which thus increases interoception, emotional expression, and homeostasis (Dieterich-Hartwell, 2017; LaMothe, 2015).

### *Using the Expressive Arts for Externalization*

“Metaphor can be a form of intimate communication” (Ellis, 2001, p. 182). Creating metaphors are one of my favorite aspects of dance and the expressive arts. Metaphors give us permission to visit feelings that may be too difficult to do so directly. They gently carry us out of our experienced reality and place us on a plane of our own creation, one where we can observe the intricacies of our experience without the experience itself observing us back. Millman et al. (2020) systematically reviewed approximately 3000 World Health Organization studies on the benefits of expressive therapies on mental health. The survey demonstrates how tools such as metaphors aid in expressiveness and significantly improve and help manage individuals’ mental health and behavioral issues (Millman et al., 2020).

A personal experience of the benefits of metaphorical use is how I can feel the colors, sizes, shapes, and textures of my embodied grief and joy over the past few years away from home. Examining who I am through the lens of a flowering plant family, the use of metaphor is

how I come home. For example, the structure of an Asteraceae, an herbaceous flowering plant, is distinguished by its characteristic of blooming composite flowers—clusters of small florets producing one flower head. I am an Aster. My tap root accesses the expansive web of mycelium connecting me to my ancestors; my stem features tiny hairs as protection; my leaves are whorled as they dance toward the sun and the warmth. I may appear to express myself as one singular collection of petals, but if you look closer you will see the intricate labyrinth of flowers within me.

Within this metaphor, physical movements emerge. Starting from the earth, sweeping up with the histories and adaptations of my family, twirling my body to receive the maximum amount of warmth (literally and figuratively), then extending my hands and fingers to bloom into many different facets. With this embodied metaphor I can feel California, how dance was my refuge and protection, and how quietly full of power I arrived in the world. Experiences that have been given names and meanings make access possible. They can be revisited and ritualized in a healing practice. Metaphor is a vehicle for externalizing and metabolizing trauma, depression, anxiety, and other types of malaise.

### **Limitations**

Building interoception is not without its complications. The multiple aspects involved can be enmeshed and hard to distinguish. These aspects include how we detect or attend to our inner bodily sensations, the accuracy of discriminating where sensations occur or how they come about, how we interpret them, as well as how we remember and give language to sensations (Khalsa et al., 2018). While we can detect the activation of certain bodily processes, the accuracy of our interpretation and labeling may be incorrect. An example being cues for hunger reading as pain or anxiety. This presents the fundamental struggle of learning, perhaps for the first time,

what we are truly processing or experiencing. If our bodies and minds have been traumatized, how do we find the language to decipher and record our interoceptive knowledge?

Khalsa et al. (2018) points out that, while we consciously have the ability to sense, interpret, and embrace much of our internal processes, the majority of our interoceptive feedback ensues unconsciously, making them clinically difficult to discern or record. The only way we can have access to the gamut of interoceptive communication is if we undergo invasive procedures, which in turn can cause undue trauma (Khalsa et al., 2018). Procedures would include probing deep within our brain or midline to examine the functionality of our central nervous system (Khalsa et al., 2018).

Other researchers, Millman et al. (2020), argue that interoception has not been fully integrated into DMT as neurobiological research is scant on whether DMT techniques using interoception help with neuroception. Findings from Dieterich-Hartwell (2017) concur and supplement:

What remains unclear...is the impact of Porges' concept of neuroception on interoception. Neuroception describes the way our autonomic nervous system responds to situations as safe or dangerous. When faulty, neuroception evaluates a situation as dangerous even though it is not. The question arises whether increased attention to and improvement of interoception can be a step toward tracking the shades of neuroception and training the brainstem to respond congruently with a situation. (p. 43).

Building interoceptive awareness with assimilated individuals in the United States presents specific challenges as western medicine continues to pathologize the human body and treat symptomatically instead of holistically (Aposhyan, 2004). The experiences patients have of their body then becomes focused on as a symptom of disease. Under this diagnostic light, bodily

sensations may be studied, interpreted, and ruminated on in a state of concern and fear (Mehling et al., 2012; Ma-Kellams, 2014). Ultimately, this may activate the patient's autonomic nervous system, putting them in the position of further dysregulation (Ma-Kellams, 2014).

### **Conclusion**

It starts from when we are in utero, the use of movement to adapt, communicate, and live in the world. Swimming in a pool of neurological signals, impulses, and the varying rhythms of the heart and lungs, we are learning from our progenitor what to be afraid of and what to love. We amalgamate the histories of the lives that came before us and assemble according to their experiences and how their nervous system processed every heartbreak and moment of joy. We embrace our predecessor's movements as our own and dance to the beat of a similar drum, passing on these vital adaptations to our next generation.

Interoception and the continual honing of its study can provide us the opportunity to feel into the intricacies of ourselves so entirely that it gives us access to self-knowledge on a cellular level. With it we can regain ownership over our whole selves—our thought patterns, behavioral impulses, maladaptations, generational pain, proclivities, and ways of being. Through bodily reintegration, we can make impactful changes as we create new holistic relationships with ourselves, no longer moving through life as dualistic machines. As we rewrite our nervous system, we can dance through life with healthier movement patterns, eventually arriving at a space with enough room for healing emotional, mental, and physical expression. Homann (2010) concludes:

Dance/movement therapy provides compelling resources for both the clinician and the patient, and neurobiology helps us understand both its value and potential more deeply.

As we learn more about how the mind functions, it is clear that consciousness cannot be

severed from the body, but is itself an integration of the functioning of the mind and body. Vagal regulation affects basic perception of experience. Mirror neurons track nonverbal body communication and are part of the complex system that allows us to understand each other's intentions. Intentions, memory, and emotions are thus integrated through sensory processing. (p. 17).

Looking back on everything I have gleaned from my curiosity and need to understand the smallest of details, I find that now when I intentionally move my body and graze my skin with all of the generations of nerve endings before it, I know that this soothing is not just for me. It is for the people who came before me. My mother and father, my grandparents, my great-grandparents, and everyone before them who embodied what they saw without a way out. I have the tools, insight, and strength to heal myself and therefore some of the souls who came before me, and maybe those who will come after, too.

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***THESIS APPROVAL FORM***

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In the judgment of the following signatory this thesis meets the academic standards that have been established for the above degree.

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